R E P O R T R E S U M E S

ED 019 660 AL 001 095

ON THE PSYCHOPHONOLOGICAL STRUCTURE OF ENGLISH INFLECTIONAL RULES.

BY- ANISFELD, MOSHE GORDON, MALCOLM

REPORT NUMBER BR-5-0602 PUB DATE MAR 68
CONTRACT OEC-1-6-050602-0431
EDRS PRICE MF-$0.25 HC-$1.08 25P.

DESCRIPTORS- *PHONOLOGICAL UNITS, *PSYCHOLOGICAL TESTING, PSYCHOLINGUISTICS, DISTINCTIVE FEATURES, NOMINALS, LANGUAGE PATTERNS, *PLURALS,

FIRST AND FOURTH GRADERS AND ADULTS WERE PRESENTED ORALLY WITH A LIST OF PAIRS OF SYNTHETIC PLURAL NOUNS DIFFERING ONLY IN THEIR FINAL CONSONANTS (E.G., NARP/NARV) AND ASKED TO JUDGE WHICH MEMBER OF THE PAIR WOULD BE A BETTER PLURAL. FIFTH GRADERS MADE SIMILAR JUDGMENTS CONCERNING PAIRS OF PAST-TENSE VERBS. MOST OF THE SOUNDS PREFERRED BY THE ADULTS (/SH/, /CH/, /J/, /F/, /V/, /TH/) AND THOSE PREFERRED BY THE CHILDREN (/SH/, /CH/, /J/) AS ARTIFICIAL PLURALS SHARE WITH THE REGULAR PLURAL MORPHEME THE PHONOLOGICAL FEATURES PLUS STRIDENCY AND PLUS CONTINUANCE WHICH ARE MORE CLOSELY IDENTIFIED WITH THE PLURAL THAN OTHER FEATURES. THE SOUNDS /CH/ AND /J/, WHICH MAY BE ANALYZED AS CONSONANT CLUSTERS CONTAINING THE REGULAR PAST-TENSE MARKERS, I.E., AS /TSH/ AND /DZH/ RESPECTIVELY, WERE THE ONLY PREFERRED PAST-TENSE MARKERS. IT IS FELT THAT THESE RESULTS REFLECT THE PSYCHOLOGICAL RELEVANCE OF THE ANALYSIS OF SOUNDS INTO COMPONENTS AND SUGGEST THAT THE FEATURES ARE ORGANIZED IN A FLEXIBLE FRAMEWORK ALLOWING THE RISING OF PARTICULAR FEATURES TO PSYCHOLOGICAL SALIENCE ACCORDING TO THE SPECIFIC TASK REQUIRED. (SEE RELATED DOCUMENT AL 000 832.) (AUTHOR/DO)

MISSION TO REPRODUCE THIS [redacted] MATERIAL HAS BEEN GRANTED
MOSHE ANISFELD

RIC AND ORGANIZATIONS OPERATING R AGREEMENTS WITH THE U.S. OFFICE OF ATION. FURTHER REPRODUCTION OUTSIDE ERIC SYSTEM REQUIRES PERMISSION OF [redacted] OWNER."

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

On the Psychophonological Structure of English Inflectional Rules

Moshe Anisfeld and Malcolm Gordon

Cornell University, Ithaca, N. Y.

First and fourth graders and adults were presented orally with a list of pairs of synthetic plural nouns differing only in their final consonants (e.g., narp vs. narv) and asked to judge which member of the pair would be a better plural. Fifth graders made similar judgments concerning pairs of past-tense verbs (e.g., shilarp vs. shilarv). Most of the sounds preferred by the adults (/sh/, /ch/, /j/, /f/, /v/, /th/) and those preferred by the children (/sh/, /ch/, /j/) as artificial plurals share with the regular plural suffix /s z/ the phonological features +strident and +continuant which are more closely identified with the plural than other features. The sounds /ch/ and /j/, which may be analyzed as consonant clusters containing the regular past-tense markers, i.e., as /tsh/ and /dzh/ respectively, were the only preferred past-tense markers. These results reflect the psychological relevance of the analysis of sounds into components and suggest that the features are organized in a flexible framework allowing the rising of particular features to psychological salience according to the specific task involved.

AL 001 095

On the Psychophonological Structure of English Inflectional Rules[1]

Moshe Anisfeld and Malcolm Gordon

Cornell University, Ithaca, N. Y.

The characterization of the sounds of a language in terms of a set of simultaneously occurring subcomponents has long been an important aspect of phonological theory in linguistics. While earlier theory sought to find acoustic correlates for the subcomponents, recent work in phonology has concentrated on functional criteria and articulatory correlates of sound description. For instance, the English consonant /p/ as in pit can be characterized in articulatory terms as follows: complete closure of the oral cavity, labial point of articulation, and lack of voicing. One of the most influential componential systems is the "distinctive feature" framework of Jacobson, Fant, and Halle (1963). Table 1 presents a characterization of the 14 "true" English consonants by reference to six features along with a description of the articulatory correlates of the features. As can be seen, each sound is classified in a binary fashion (plus or minus) on each feature. Individual sounds as

---

Insert Table 1 about here

---

well as classes of sounds can be uniquely defined within this system. For instance, /z/ is fully describable as a consonant

having the features -grave, +diffuse, +strident, -nasal, +continuant, and +voiced. The class of fricative consonants, including /f/, /v/, /th/, /ð/, /s/, /z/, /ch/, /j/, /sh/, and /zh/, is fully defined in the feature system by the conjunction of the feature values -grave and +strident, as these and only these consonants can be so characterized.

Features are used not only in the description of sounds and classes of sounds, but also, and mainly, in the statement of morphological and phonological rules. Generative transformational linguists have been systematically formulating the rules governing the sound patterns of English and other languages in terms of features (e.g., Chomsky, 1967; Halle, 1964a, 1964b; Postal, 1968). The use of features in the formulation of rules can be demonstrated by the following statement of the regular English pluralization rules. (a) Nouns are pluralized by appending a -grave, +diffuse, +strident, -nasal, and +continuant consonant to the singular stem. These five features define the characteristics common to /s/ and /z/, which constitute the regular plural suffixes, e.g., <u>backs</u> /bæks/, <u>bags</u> /bægz/, and <u>roses</u> /rowzɨz/. (b) Singulars ending in -grave and +strident sounds, e.g., /z/ as in /rowz/, after which the plural marker as defined in (a) is not allowed by English sound-sequencing rules, have the vowel /ɨ/ (a notational abbreviation for a complex of features) suffixed before they undergo pluralization. (c) The general rule of voicing assimilation is called up to assign to the plural suffix of (a) the same sign

(plus or minus) on voicing as the sound preceding it has. Consequently, singulars ending in voiceless sounds such as /k/ will have the voiceless /s/ appended to them and those ending in voiced sounds such as /g/ and /ǰ/ will have the voiced /z/ appended to them.

The earlier interest of psychologists in the feature scheme and in other componential analyses of sounds centered around the exploration of the relevance of such analyses to the understanding of phenomena in speech perception and memory (e.g., Miller and Nicely, 1955; Wickelgren, 1966). The investigation of the role of distinctive features in the psychological functioning of morphological rules was recently undertaken in a study by Anisfeld, Barlow, and Frail (in press). In a study of the regular English pluralization rules, they presented Ss with synthetic singular nouns ending in /l/, /n/, or /r/, e.g., nar, and asked them which of two artificial plural forms, e.g., narp and narv, they preferred as a plural name. The plural forms were generated by adding to the singular a consonant other than the appropriate plural marker /z/. The consonants they used as plurals were /p/, /b/, /m/, /f/, /v/, /k/, /g/, /t/, /d/, /n/, and /ch/, the last one being involved only in three comparisons. The Ss in this study were at four age levels: kindergarten pupils, second graders, fourth graders, and adults. This study showed that not all five features defining the plural suffix are effective predictors of Ss' choices. Only the sounds (/f/, /v/, and /ch/)

that share with /s z/ the features +continuant and +strident were significantly preferred by the second- and fourth-grade Ss over sounds having negative signs on these features. This result is interpretable within the feature framework, since each of these two features distinguishes the plural archisegment /s z/ from more other consonants than any other feature. The features +strident and +continuant may thus be more salient in the concept of plurality than the other features. The kindergarten children showed no significant preference for any feature and the adults preferred +nasal sounds over -nasal sounds. With respect to the kindergarten results, it was felt that there were too few Ss in this group (20 as compared to 40 in each of the other two groups of children) for the features to counteract a strong bias, characteristic of the young Ss, to choose the second of the two alternatives offered. With respect to the adult Ss, it was suggested that they might have interpreted the task as one of forming irregular plural forms and modelled their responses on such irregular English plurals as children, and oxen and on foreign plural endings. (The Hebrew plural ends in /m/ as in cherubim and the German in /n/ as in Studenten.)

The present paper reports experiments designed to overcome these and other limitations of the Anisfeld et al. study and to gain more specific insight into the psychophonological composition of morphological rules. Measures were taken to overcome the limitation of the kindergarten experiment by testing

a larger number of young Ss in a similar age group and of the adult experiment by explicitly instructing a new group of adults to model their responses on the regular cases. In addition, more consonants were used in the present study than in the earlier one and every sound was compared with every other sound as a plural choice. This extension will enable a more definite isolation of the relevant feature or features. In particular, because of the restricted number of comparisons made in the previous study, it could not be ascertained whether the feature +continuant exerted an influence independently of the feature +strident.

The results of the previous study were interpreted as supporting the notion that a feature analysis is relevant to the psychological functioning of the pluralization rules in English. Another interpretation might be that the results reflect sound preferences in general, not plural preferences. Although this interpretation cannot find support in differential sequential probabilities (Hulzén, Allen, and Miron, 1964), it can nevertheless not be conclusively ruled out on the basis of the previous data alone. To decide on this problem, an experiment was conducted in which fifth-grade children were required to choose mock past-tense forms in a format similar to the pluralization study. The regular past-tense rule of English can be stated as follows in terms of features: (a) Verbs are past-tensed by appending a -grave, +diffuse, -strident, -nasal,

and -continuant consonant to the present-tense stem. This feature complex defines the characteristics common to the regular past-tense markers /t/ and /d/ (e.g., locked /lakt/, tagged /tæ gd/, and rated /reytɨd/). Note that the past-tense markers differ from the plural markers on the very features, continuance and stridency, found relevant in the previous pluralization study.
(b) Present-tense verbs ending in /t/ and /d/ (e.g., /reyt/) have the vowel /ɨ/ suffixed before they undergo past-tensing.
(c) The general rule of voicing assimilation is called up to assign to the past-tense suffix of (a) the same sign on voicing as the sound preceding it has. Since the pluralization and past-tense tasks are similar and involve rules of the same form, it is felt that if different patterns of choices are obtained, one could conclude that the Ss were not simply choosing sounds on the basis of general preference, regardless of the task, but that the task played a determining role.

Method

Subjects

First- and fourth-grade pupils and adults were tested for the pluralization study and fifth-grade pupils for the past-tense study. There were 64 Ss, 35 male and 29 female, in the first-grade group. Their mean age was 6 years and 6 months. The fourth-grade group was composed of 66 Ss, 28 male and 38 female; mean age 9 years 4 months. The adult Ss were 96 students, 45 male, 51 female, from an introductory psychology course at

Cornell University; mean age 19 years. Of the 64 Ss, 27 male and 37 female, used in the past-tense study, there were 62 fifth graders, one fourth grader and one sixth grader; mean age 10 years 4 months. All the younger Ss were from a public elementary school in Ithaca, N. Y., with the exception of one first-grade girl and one fourth-grade boy who were from another elementary school just outside of Ithaca.

Materials

Pairs of sketches were used with the children to illustrate the synthetic nouns and verbs. Pictures were not used with the adult Ss. In the pluralization study, the first picture of the pair showed a single cartoon animal and the second picture showed a group of more than one of the same cartoon animal used in the first picture. In the past-tense study, the first drawing of the pair, representing the present tense, depicted a person or a bird performing a clearly interpretable action, which could not, however, be described in English by a specific single-word verb, e.g., a child hanging upside down from a tree. The second drawing of each pair depicted the same action and the same subject but he was either smaller or wore different clothes to represent the past tense.

Test items consisted of a pair of synthetic words differing in the final consonant only, e.g., gorm-gorf, and shilarp-shilarf. Each S had to choose which of the two words was preferable as a plural or past-tense form. The singular nouns and the present-

tense verbs had as a final consonant, preceding the plural marker, either /l/, /r/, or /n/ (in the past-tense study only the first two). These three were used as stem-final consonants because they can be followed in English by a large number of other consonants to form permissible sound sequences. All consonants in Table 1 were used as plural markers except the regular plural suffixes /s/ and /z/, and /ȡ/ and /zh/, which rarely occur in final position following a consonant. The past-tense study excluded /t/ and /d/ and /ȡ/ and /zh/ for similar reasons. Each of the remaining 14 consonants was compared with each other as an artificial plural or past-tense marker. For this purpose they were appended randomly, within constraints noted below, to synthetic stems. In the pluralization studies the stems were CVC monosyllabic words and in the past-tense study they were bisyllabic words. Each item thus consisted of a stem, e.g., lar, and a pair of inflected words, e.g., larb-larg, between which S had to choose. There were 91 such items in the pluralization study with the first- and second-graders. For the first grade, these were randomly divided into four portions, three of 23 pairs each and one of 22 pairs. Sixteen first graders were tested on each portion, thus yielding 16 entries for the comparison of every sound against every other sound. For the fourth grade, the 91 pairs were divided into three groups, two of 30 pairs each and one of 31 pairs. Twenty-two fourth graders were tested on each portion, yielding 22 entries for every sound-by-sound comparison.

In both groups, the pairs were arranged in two random orders within each portion, and the two items within each pair were in one order for half of the Ss and in reverse order for the other half. An equal number of Ss was tested on each sublist.

In the adult pluralization study, the number of pairs was increased to 190: 91 were contributed by the cross-comparisons of 14 consonants appended to /r/-final stems, 78 by 13 consonants appended to /l/-final stems, and 21 by 7 consonants appended to /n/-final stems. The number of /l/-final inflections was 13 because no final /-lg/ cluster could be found in English, and the number of /n/-final inflections was further reduced because no English words could be found that ended in /n/ plus /p/, /b/, /m/, /f/, /v/, /n/, or /sh/. The 190 pairs were divided into three portions, two containing 63 pairs each and one containing 64 pairs. Sixteen Ss were tested on each portion. As in the case of the children, the pairs within the portions were arranged in two different random orders, and the order of the words within a pair was counterbalanced. In addition, in order to guard against the possibility that the association of a particular inflectional consonant with the stem to which it was appended influenced Ss' responses, the pairs of inflectional consonants were detached from the stems to which they were previously appended and randomly re-appended to new stems, within the constraint, outlined above, that the new inflected words make English sequences. The whole process of division into three portions, randomization,

and counterbalancing was repeated for these new items. Sixteen Ss were tested on each of the new portions. Altogether then each sound-by-sound comparison involved either 96 judgments, for the consonants which followed all three stem-endings, or 64 judgments, for those following only two stem-endings.

In the past-tense study there were 157 pairs: 91 contributed by the 14 consonants appended to /r/-final stems and 66 contributed by 12 consonants appended to /l/-final stems. In addition to /g/, /m/ was also omitted after /l/ because in many dialects the /l/ drops when followed by /m/, as in calm. (Also, the /ch/-/sh/ comparison was inadvertantly omitted after stems ending in /r/.) The 157 pairs were divided into eight portions, seven containing 20 pairs each and one containing 17 pairs. Each portion was given to eight Ss. The number of sound-by-sound judgments is thus 16 for the consonants following both stem-endings and 8 for those following only one of them. The other aspects of item and word ordering were the same as for the adult study.

Procedure

In all studies, Ss were tested individually by female Es who were unaware of the theoretical expectations. They took care, especially with the young Ss, to establish rapport and to maintain it throughout the testing session. All tests were conducted orally. In the pluralization study with children, each S was shown a drawing of a single cartoon animal and one of the /CVC/ trigrams (e.g., dar) was given to it as a "new name"

for a "new animal." The S was next shown a picture of two or more cartoon animals identical to the single animal and asked which of two plurals, constructed by appending to the singular stem two different consonants (e.g., darm and darch), he preferred as a name for the second picture. The S had to pronounce both plural names correctly before making his choice between them. The choice was indicated by S's saying one of the alternatives. If S's pronunciation of one of the plurals was in error, E repeated both plurals and asked S to pronounce them again. If after two attempts the child was unable to pronounce a word, no response was recorded for the comparison. The number of incorrect pronunciations was minimal, amounting to 59 errors in 1456 pairs for the first grade and to 20 errors in 2002 pairs for the fourth grade. All fifth graders and adults pronounced the words correctly, requiring only an occasional repetition.

Basically the same procedure was used with the adult Ss as with the children except that they were not shown pictorial representations for the synthetic words. The adult Ss were instructed to make their choices in relation to the regular English plural and to give their "intuitive impressions" rather than their considered judgments. Halfway through the list there was a break of up to five minutes to alleviate monotony, at the end of which Ss were reminded that their task was to choose plurals "that feel...most like the regular English plural."

The procedure of the past-tense study with fifth graders

was similar to the pluralization studies. Each S was shown the first of two action drawings and one of the new verbs was assigned to it. e.g., "This is a picture of a girl MICKERING." The S was then shown the second picture of the pair and told that, as he could see, this was the same actor performing the same action, except that the event occurred last year. The S was then asked which of a pair of words he preferred to describe what the figure was doing last year, e.g., MIKERP or MIKERM. Following completion of the list, personal data were obtained from all Ss as well as their reactions to the task. The entire session took approximately 7 to 12 minutes with each child and 12 to 17 minutes with each adult.

Results and Discussion

Counts were made of the number of times each sound was chosen over all other sounds and the number of times it was rejected in these comparisons. The chi-square values comparing the preferences versus the rejections of each sound are given in Table 2 for the four groups of Ss. The calculation of these values can be exemplified as follows. In the first grade, 16 Ss judged every comparison of /j/ with each of the 13 other inflectional consonants. Excluding three mispronunciations, the total number of comparisons involving /j/ was 205, (13x16)-3. Of these, /j/ was chosen 122 times and rejected 83 times, yielding a chi-square value of 7.42. This value is recorded in Table 2 in the /j/ row in the column for the first grade.

Insert Table 2 about here

As can be seen in Table 2, the adults exhibited strong likes and dislikes; every single sound was either preferred or rejected as a plural, at very high levels of significance. They preferred /f/, /v/, /sh/, /ch/, /j/, /th/, /m/, and /n/, and rejected /k/, /g/, /t/, /d/, /p/, and /b/. The children's choices and rejections were much more limited. The first and fourth graders significantly preferred /sh/, /ch/, and /j/. The fourth graders significantly rejected /b/, /d/, /k/, and /t/. Only /n/ was significantly rejected by the first graders, and even this at the lowest level of all rejections and preferences. The fifth graders who, it will be recalled, participated in the past-tense task rather than the pluralization task, significantly preferred only /ch/ and /j/, and rejected only /s/ and /z/.

We will now turn to a discussion of the adult results. The preference for /m/ and /n/ seems to indicate that despite the explicit directions they received to respond by reference to regular English plurals, the adult Ss were influenced by irregular English plurals and/or foreign plural endings, as was the case in the earlier study (Anisfeld et al., in press). Twenty-six Ss in the adult sample knew either Hebrew or German or both, and several of them expressed the feeling in the post-experimental interview that they could not help being influenced by this

knowledge. The emphasis in the instructions on regular English plurals, however, was effective in manifesting other preferences not revealed in the previous study. The sounds, other than the two nasals, chosen by the adults were either +strident, i.e., /ch/ and /j/, +continuant, i.e., /th/, or both, i.e., /f/, /v/, and /sh/. It will be recalled that these two features also stood out in the previous study. These six chosen consonants constitute together with /s/ and /z/ (and /ð/ and /zh/) the class of fricatives, a class generally recognized as articulatorily distinct and functionally significant in English (e.g., Bronstein, 1960, ch. 5). The first- and fourth-grade children restricted their plural choices to only three of the fricative sounds, /sh/, /ch/, and /j/. These three, however, are not a random sample; they fall into a recognized subclass (Halle, 1964a, p. 328), defined by -grave and +strident, which includes also /s/ and /z/ (and /zh/). This category is specifically relevant to pluralization: its members, and only they, take /ɨz/ for pluralization, rather than /s/ or /z/. The sounds /sh/, /ch/, and /j/, chosen by the first and fourth graders as plurals, thus belong to a subclass which has the distinction of containing /s/ and /z/ as members and being functionally significant in pluralization. The children's requirements for acceptance as a plural thus appear more stringent than the requirements of the adults, their strongest attraction being restricted to sounds which fall with /s/ and /z/ into a class specifically relevant

to pluralization. However, a preference, although a weaker one, for the other fricative sounds, i.e., /f/, /v/, and /th/ can also be found in the children's results when the sounds in the "pluralization subclass" are excluded. The chi-square values for the choices of /f/, /v/, and /th/ over the 10 nonfricative sounds are all positive, although only one of them (/v/ for the fourth grade) is statistically significant (chi-square = 6.0, $p < .02$).

Generally, the preferences and rejections of the children are not as strong as those of the adults. This is probably partly due to the smaller number of Ss involved in the comparisons and partly to the masking effect of a bias to choose the second inflected word of a pair regardless of what it was. In the first grade, 54 Ss chose more words presented second than presented first and 9 Ss chose more words presented first than presented second (chi-sq. = 32.1, $p < .001$), in the fourth grade the respective figures were 42 and 22 (chi-sq. = 6.2, $p < .02$), and in the fifth grade 38 and 21 (chi-sq. = 4.9, $p < .05$).

The notion that the children, like the adults, preferred all fricatives over nonfricatives but that the pluralization-relevant fricatives enjoyed their highest attraction as synthetic plurals agrees well with the results of the previous study where in the virtual absence of the /sh/, /j/, and /ch/ sounds, the children showed a clear preference for the other fricative sounds (/f/ and /v/) offered them. Apparently, the unavailability of the

pluralization-relevant fricatives forced the Ss in the earlier study to lower their standards.

The Ss who participated in the pluralization experiment thus showed a preference for all fricative sounds offered them or for a distinct subset of these sounds. This was not the case in the past-tense study with the fifth graders. They preferred the consonants /ch/ and /j/ but not the consonant /sh/ which attracted by far the highest number of choices in the other three groups of Ss. The two sounds the fifth graders did choose as artificial past-tense markers have a dual status in phonological theory. Although they are classifiable as fricatives, they also belong to a category contrasted with fricatives, i.e., stops, and are subclassified into a category of their own and labeled affricates. Gleason (1961, pp. 22-23) states this point as follows:

> They [the affricates]...are composed of a stop plus a movement through a fricative position: /č/ [=/ch/] starts with a sound similar to /t/ and moves through one rather similar to /š/ [=/sh/]; /ǰ/ starts with a sound similar to /d/ and moves through a sound rather similar to /ž/ [=/zh/]....some linguists have advocated treating them as /tš/ and /dž/.

In view of this and because the most popular fricative /sh/ was not chosen by the fifth graders, it is very likely that the reason /ch/ and /j/ were chosen by these Ss is not because they

are fricatives but because they contain within them the regular past-tense markers /t/ and /d/. Except for /t/ and /d/ there are no other sounds relevant to past-tense as there are in the case of pluralization, which explains why no other sounds were chosen in this task.

So far we have concerned ourselves with the characteristics of the sounds Ss selected as artificial plural or past-tense markers. Now we have to turn to an examination of the nature of their rejects. The case of the adults is simple: they rejected the sounds that had signs opposite those they chose, i.e., negative signs, on the features of stridency and continuance. Two of the most highly rejected sounds by the adults were /t/ and /d/ which, of course, constitute the past-tense markers and probably for this reason were considered as inappropriate plurals. This strong dislike of /t/ and /d/ as plurals is also evident in the fourth grade. Apart from these two sounds, fourth graders significantly rejected only /b/ and /k/. As in the case of their preferences, the younger Ss were more limited than the adults in their rejections, reaching the point where at the youngest age studied, grade one, there was barely a single significant rejection. The fifth graders showed an antipathy only for /s/ and /z/ which are present-tense third-person suffixes and plural markers and hence unlikely candidates to mark the past tense.

Conclusions

The difference in results between the pluralization task and the past-tense task as well as the whole pattern of findings indicate clearly that the Ss responded in reference to the specific morphological tasks they were requested to perform. As past-tense artificial markers the Ss selected /ch/ and /j/, sounds which are analyzable as containing, respectively, the regular past-tense markers /t/ and /d/. As plurals the Ss selected fricative sounds, i.e., sounds that are characterized as either +strident or +continuant. Similarity of the artificial inflections to the regular plural marker /z/ on other features played no significant role in determining Ss' choices. For instance, voiced sounds (like /z/) were not chosen over voiceless sounds, this being the case even for minimal pairs such as /b/-/p/ and /g/-/k/ where the voiced sound was in no case significantly preferred over its voiceless counterpart. The two features that did significantly influence, in the present study and in the previous one, Ss' plural choices carry, as noted in the Introduction, a greater weight in distinguishing the plural archi-segment /s z/ from other consonants than do the other features. Moreover, the features +strident and +continuant are the only ones that distinguish /s z/ from the other major inflectional suffix in English, namely /t d/. This study has thus shown that, as insisted by linguists (for an explicit discussion, see de Saussure, 1959), distinguishing characteristics are more important in language than absolute characteristics.

References

Anisfeld, M., Barlow, Judith, and Frail, Catherine M. Distinctive features in the pluralization rules of English speakers. Lang. Sp., in press.

Bronstein, A. J. The pronunciation of American English. New York: Appleton-Century-Crofts, 1960.

Chomsky, N. Some general properties of phonological rules. Language, 1967, 43, 102-128.

Gleason, H. A. Introduction to descriptive linguistics. 2nd ed. New York: Holt, Rinehart and Winston, 1961.

Halle, M. On the bases of phonology. In J. A. Fodor and J. J. Katz (Eds.), The structure of language. Englewood Cliffs, N. J.: Prentice-Hall, 1964. Pp. 324-333. (a)

Halle, M. Phonology in generative grammar. In J. A. Fodor and J. J. Katz (Eds.), The structure of language. Englewood Cliffs, N. J.: Prentice-Hall, 1964. Pp. 334-352. (b)

Hulzén, L. S., Allen, J. H. D., and Miron, M. S. Tables of transitional frequencies of English phonemes. Urbana, Ill.: Univer. of Illinois Press, 1964.

Jakobson, R., Fant, C. G. M., and Halle, M. Preliminaries to speech analysis. Cambridge, Mass.: M.I.T. Press, 1963.

Miller, G. A., and Nicely, P. E. An analysis of perceptual confusions among some English consonants. J. acoust. soc. Amer., 1955, 27, 338-352.

Postal, P. Aspects of phonological theory. New York: Harper & Row, 1968.

de Saussure, F. Course in general linguistics. Translated from French by W. Baskin. New York: Philosophical Library, 1959.

Wickelgren, W. A. Distinctive features and errors in short-term memory for English consonants. J. acoust. soc. Amer., 1966, 39, 388-398.

Footnote

[1]The research reported herein was performed pursuant to a contract with the U. S. Department of Health, Education, and Welfare, Office of Education. We gratefully acknowledge the assistance of Judith Barlow, Deborah Fein, Ann Savishinsky, and Elizabeth Caldwell for help in the preparation of materials, testing of Ss, and analysis of data. We are also indebted to Dr. Leonard Buyse, Assistant Superintendent of the Ithaca School System, and to Miss Louise Wilson, Principal of the Belle Sherman School, for so readily and speedily arranging for the testing of pupils in this school. We have benefitted from discussions of feature theory with N. Chomsky and M. Halle.

Table 1

Distinctive Feature Representation of the Consonants of English

(From Halle, 1964a)

	p	b	m	f	v	k	g	t	d	th[a]	ð[a]	n	s	z	ch	j[a]	sh	zh[a]
Grave	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
Diffuse	+	+	+	+	+	-	-	+	+	+	+	+	+	+	-	-	-	-
Strident	-	-	-	+	+	-	-	-	-	-	-	-	+	+	+	+	+	+
Nasal	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Continuant	-	-	-	+	+	-	-	-	-	+	+	-	+	+	-	-	+	+
Voiced	-	+	+	-	+	-	+	-	+	-	+	+	-	+	-	+	-	+

Articulatory Characterization of the Features

The articulatory characteristics of these features can be roughly described as follows. The description is for the positive pole: The sounds that do not have the characteristics described for a particular feature fall on the negative pole of that feature.

Grave--point of articulation in the very front, i.e., the lips, or the very back of the mouth, i.e., velum.

Diffuse--articulation in the front part of the mouth, i.e., from the alveoler ridge forward.

Strident--articulation characterized by relatively great noisiness resulting from forcing the air stream through a complex impediment.

Table 1 (cont'd)

Nasal--articulation characterized by release of the air stream, wholly or partly, through the nasal cavity.

Continuant--an uninterrupted expiration of the air stream through the oral cavity.

Voicing--periodic vibration of vocal cords during articulation.

[a]/th/ pronounced as in ether, /ð/ as the th in either, /j/ as in judge, and /zh/ as the z in seizure.

Table 2

Significant Chi-Square Values Comparing the Number of Times Each Sound was Preferred Over All Other Sounds Combined with the Number of Times It was Rejected

Sounds	Preferred (+) or Rejected (-)			
	1st gr.	4th gr.	Adults	5th gr.
b	--	- 6.5	- 50.6	--
ch	5.3	20.8	27.5	4.9
d	--	- 8.1	-102.2	( )
f	--	--	20.8	--
g	--	--	- 31.3	--
j	7.4	4.6	61.0	8.3
k	--	- 4.0	-164.5	--
m	--	--	25.9	--
n	- 4.4	--	24.5	--
p	--	--	- 24.9	--
s	( )	( )	( )	- 7.5
sh	18.7	30.3	89.2	--
t	--	-12.3	- 96.9	( )
th	--	--	37.2	--
v	--	--	67.3	--
z	( )	( )	( )	-14.0

Note.--The significance levels for a chi-square with 1 df are as follows: 3.8--.05, 5.4--.02, 6.6--.01, and 10.8--.001. Dashes indicate that the chi-square did not reach significance at the .05 level. Parantheses indicate that the sound was not used.